LLNL Environmental Restoration Division (ERD)
Standard Operating Procedure (SOP)

ERD SOP 2.10: Well Disinfection and Coliform Bacteria Sampling—Revision: 3

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1.0 PURPOSE

The purpose of this SOP is to describe a chlorination procedure to disinfect monitor wells prior to collecting ground water samples that will be analyzed for coliform bacteria as recommended in Appendix C of the manual, *"Water Well Standards: State of California."*

2.0 APPLICABILITY

This SOP procedure is applicable to the disinfection of monitor wells prior to sampling for total and fecal coliform bacteria.

3.0 REFERENCES

3.1 Driscoll, G. F. (1986), *Groundwater and Wells*, Second Edition, Johnson Division, St. Paul, Minn.

3.2 Lamarre, A. L. (1989), *Sampling and Analysis Plan for Coliform Bacteria in Water From Selected Site 300 Monitor Wells*, Memo, Lawrence Livermore National Laboratory, Livermore, Calif.

3.3 State of California Department of Water Resources Agency (1981), Appendix C, Manual, "Water Well Standards: State of California," Sacramento, Calif.

4.0 DEFINITIONS

See SOP Glossary.

5.0 RESPONSIBILITIES

5.1 Division Leader

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely, comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

5.2 Field Personnel

The field personnel are responsible for performing all field activities in a safe and efficient manner according to guidelines established herein, as well as associated SOPs.

5.3 Field Support Personnel

The field support personnel are responsible for providing necessary equipment, collection devices and general field support which enables personnel to perform field activities in a timely and efficient manner.

5.4 Sampling Coordinator (SC)

The SC's responsibility is to supply a quarterly Ground Water Sampling Plan, which includes the wells to be sampled for coliform bacteria. A spread sheet indicating the amount of disinfectant to apply to each well prior to sampling for coliform bacteria is also provided by the SC.

6.0 PROCEDURES

At the direction of the SC, the designated wells are disinfected in preparation for coliform bacteria sampling. The wells are disinfected to remove any bacteria within the well casing. Each well will receive a dose of chlorine solution containing at least 100 mg/L of available chlorine. A calculation will be made to determine the appropriate amount of chlorine to add based upon the amount of water standing in the well casing.

6.1 Preparation

6.1.1 Perform preparation activities per SOP 4.1, "General Instructions for Field Personnel."

6.1.2 The wells to be sampled for coliform bacteria will be included in the quarterly Sampling Plan provided by the SC. Prior to sample collection, all calculations will be made and appropriate chlorination performed.

6.1.3 A 5.25% sodium hypochlorite solution (standard household bleach) is routinely used. The U.S. EPA recommends using a solution with a minimum concentration of 100 mg/L for proper sterilization. The following formula is used to calculate the quantity of sodium hypochlorite to be added to the well:

Volume hypochlorite (oz.) = (W) (64) (R/P)

where

W = water volume in well (gal),

R = required hypochlorite concentration in the well (decimal), and

P = Percent available chlorine (decimal).

6.1.4 When using the above equation, the required hypochlorite concentration and percent available chlorine should be in decimal form. For example: 100 mg/L = 100 ppm = 100/1,000,000 = 0.0001; percent available chlorine of 5.25% = 0.0525. The volume (gal) is the amount of water in the well casing (casing volume) and is calculated as per ERD SOP 2.1, "Presample Purging of Wells." These calculations should be documented on the appropriate field forms.

6.1.5 The SC or appropriate personnel should inform the contract analytical laboratory ahead of time to allow for preparation when collecting samples on a rush turn-around time or samples having short hold times.

6.1.6 In consultation with the SC and field support personnel, ensure that adequate containment devices are available at the well head for purge water collection. The quantity of purge water to be collected for each well is listed in the Routine Sampling Schedule.

6.1.7 Ensure that an adequate amount of 5.25% sodium hypochlorite (standard household bleach) is on hand, according to the calculated dosages of the required solution. Use a fresh supply for every sampling event.

6.1.8 Ensure the availability of a pool test kit with the appropriate solution to test for chlorine in water which measures in the ppm range.

6.2 Operation

6.2.1 Add the calculated amount of 5.25% sodium hypochlorite to the well. Use the pump to recirculate the water to ensure thorough mixing of the disinfectant with the well water. Turn the pump on and off several times during this procedure.

6.2.2 After disinfection, the water in each well will be allowed to stand for 24 hours. After 24 hours the water should be pumped until the presence of chlorine is no longer detectable. Test for the presence of chlorine by using a pool test kit according to manufacturers instructions. Once the water is free of residual chlorine, a coliform bacteria sample may be collected in a 100 mL pre-sterilized polyethylene container as described in ERD SOP 4.3, "Sample Containers and Preservation."

6.3 Post Operation

6.3.1 Perform post operation per SOP 4.1.

6.3.2 Before leaving the sampling site, cross check sample containers with those recorded in the logbook.

6.3.3 To maintain and document sample custody, follow the procedure for completing a Chain-of-Custody (CoC) form in SOP 4.2, "Sample Control and Documentation."

6.3.4 After all samples are collected and preserved as necessary, any non-dedicated sampling equipment should be decontaminated prior to sampling another site in order to prevent cross-contamination of equipment between locations (see SOP 4.5, "General Equipment Decontamination").

6.3.5 Deliver all field logbook notes (upon request), Ground Water Sampling Data Sheets, and (CoC) forms to the SC daily.

6.3.6 The SC will retain copies of the Ground Water Sampling Data Sheets and provide the originals to the Data Management Team (DMT) for final archive. The SC will provide copies of the forms to the appropriate Operations and Regulatory Affairs Division Analyst, as necessary.

6.3.7 Submit the coliform samples to the analytical laboratory as soon as possible due to the short holding time for coliform analyses (6 hours).

7.0 QA RECORDS

7.1 Ground Water Sampling Data Sheets

7.2 Document Control Logbooks

7.3 Chain-of-Custody Forms

8.0 ATTACHMENTS

Not applicable.